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(19)(CA) **APPLICATION FOR CANADIAN PATENT** (12)

(54) Process for Preparing Rubber-Containing Waste for Further Treatment

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(57) Abstract

The description relates to a process for preparing rubber-containing waste for further treatment by making use of the brittleness of individual components of the waste by cooling the waste, in which the rubber-containing wastes is milled in a worm-drive press, cooled at least in the press and possibly must finely divided before insertion in the press. Liquid nitrogen or water is added for cooling purposes. This process uses less power and less coolant like nitrogen or the like is needed.

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PROCESS FOR PREPARING RUBBER-CONTAINING WASTE FOR FURTHER TREATMENT

Description

The invention concerns a process for preparing rubber-containing waste for further treatment.

Rubber-containing wastes, such as old rubber, automobile tires, reinforced rubber seals, for instance for windows and doors, in particular for automobiles, hoses, such as oil-hoses or the like, at present are generally more or less pre-comminuted for subsequent further processing and further use. Thereafter the wastes are further processed in part, the attempt being made to separate the individual components of these waste materials. For example, metals such as iron, steel or iron wires, plastics, fibers, formed fabrics or the like may be present in addition to the rubber components.

It is already known to grind or smash rubber-containing wastes in mills, these wastes having been previously or simultaneously cooled or deep-cooled in order to exploit the brittleness of the cold rubber and especially to avoid rubber vulcanization or melting of any plastic. Cooling the wastes also increases the brittleness especially of the rubber, and accordingly, it can be separated more easily from any metallic components. In particular, the metallic components are released and separated from the rubber and other components. Depending on the required temperature, cooling is carried out by adding cold water or liquid nitrogen or the like.

Thereupon the mixture of individual components which are discharged from the mill can be separated. For example, iron parts may be pulled out using a

magnet. Fibers or the like may be sucked out where called for. The mixture of individual components also may be separated by sifting.

However, the mills take up much space at the work site and consequently large quantities of coolants such as liquid nitrogen must be added.

Accordingly, it is the object of the present invention to employ a process for preparing rubber-containing waste for further treatment, said process being more energy-conserving and requiring less coolant such as nitrogen or the like.

This problem is solved by the process defined in claim 1. In this process preparing rubber-containing wastes for further treatment, the rubber-containing wastes are milled in a screw press, are compressed at a pressure up to 100 bars, and the wastes are cooled at least in said press.

The process of the invention lowers the consumption of liquid nitrogen or other coolants to well below 50 % of the quantities required in the procedures known heretofore, such as grinding in mills or the like, because the free volume between the waste particles in the screw press is much reduced and is decreased even to a few percent by volume. In particular, the metal components are released from the other components in the screw press. Moreover, the rubber is ground and pressed so hard that the plastic and/or fiber components separate from it.

In a first embodiment of the process of the invention, liquid nitrogen is added to the waste for purposes of cooling. The boiling point of nitrogen is -195.8°C. When using liquid nitrogen, the waste material can be cooled down to about -120°C. It is discharged from the screw press at a temperature of about 50°C.

In another embodiment of the process of the invention, relating to higher acceptable temperatures, for instance when preparing old tires containing rubber which is already more brittle, cold water can be added for cooling.

The coolant can be admixed with the wastes before same are fed into the screw press, as a result of which thorough mixing of waste particles and coolant leads to optimal cooling of the waste particles.

The special cooling furthermore precludes vulcanization or post-vulcanization when grinding the wastes in a screw press.

Part of the coolant, such as liquid nitrogen or water, evaporates in the screw press during grinding. Following discharge from the screw press, the residual liquid is separated from the solid parts.

Preferably, the solid wastes are pre-comminuted before being fed to the screw press, the rubber-containing wastes being fed to the screw press in, for example, granulated form. Thereby the wastes are more easily fed into the screw press, and moreover, the smaller particles can be cooled more rapidly and easily. In addition, the components issuing from the screw press are more easily separated. The granulate from the rubber-containing wastes, such as old tires, may evince diameters of 10 to 40 mm. As a result, the metallic components are present in smaller sizes, allowing easier separation from the other components by magnetism or sifting.

The pressure exerted on the wastes in the screw press may be up to 100 bars.

In a preferred embodiment of the process, the air present between the granulates, which is generally warm environmental air, is removed from the wastes that will be fed to the screw press. If air were present in the screw press, the temperature would rise in it excessively, and hence more coolant would have to be admixed.

Because of higher heat in the screw press, liquids such as water or liquid nitrogen will evaporate. Advantageously, this evaporated liquid shall be collected and cooled again.

Preferably, the constituent parts of the screw press, for instance the case, the screw or the like, shall be cooled by liquid nitrogen, cold water or the like passing through cooling ducts, so that both cooling is improved and the coolant can be used again without purification being required.

The mixture of the individual waste components discharged from the screw press is thereafter subjected to separation such as sifting, magnetic removal of metallic parts or the like.

The design of the screw press may be such as is disclosed for instance in WO A 83/03,999, German patent documents A 3,714,508; A 3,714,509 and A 3,714,518. This is a screw press with two mutually parallel screws. However, other screw presses also may be used.

Claims

1. A process for preparing rubber-containing wastes for further treatment by exploiting the brittleness of individual waste-components by cooling the wastes to be prepared,

characterized in that

the rubber-containing wastes are milled in a screw press, are compressed at a pressure of up to 100 bars, are cooled at least in the screw press and, optionally are pre-comminuted before being fed to the screw press.

2. Process defined in claim 1, characterized in that liquid nitrogen is admixed to the wastes for cooling.

3. Process defined in claim 1, characterized in that water is admixed to the wastes for cooling.

4. Process defined in one of the above claims, characterized in that the rubber-containing wastes are introduced as granules into the screw press.

5. Process defined in one of the above claims, characterized in that the air present between the granulates of the wastes to be fed into the screw press is removed.

6. Process defined in one of the above claims, characterized in that the constituent parts of the screw press, for instance the case, the screw or the like are cooled by liquid nitrogen, cold water or the like.

7. Process defined in one of the above claims, characterized in that the mixture of individual waste-components discharging from the screw press is subjected to separation such as sifting, magnetic removal of metallic parts or the like.

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